What is claimed is:

1. Apparatus for processing materials in an atmospheric pressure radio-frequency non-thermal plasma comprising:

an electrically conductive enclosure defining an interior space with a surface and openings for introduction of a gas and for entry and exit of a material to be processed;

an electrode situated inside said interior space and spaced apart from said surface of said interior space a distance sufficient to allow placement of said material to be processed;

a mechanical action for placing said material to be processed inside said interior space on or between said electrode and said electrically conductive enclosure;

wherein a gas is introduced into said interior space through said opening for introduction of a gas and a radio-frequency voltage applied between said electrically conductive enclosure and said electrode creates a plasma in said interior space for processing said material to be processed within said electrically conductive enclosure.

2. The apparatus as described in Claim 1, wherein said means for placing said material to be processed comprises a roller.

3. The apparatus as described in Claim 1, wherein said gas is comprised of an inert gas and a chemically reactive gas.

4. The apparatus as described in Claim 1, wherein said gas is introduced at low flow rate.

5. The apparatus as described in Claim 3, wherein said inert gas is helium and said chemically reactive gas contains oxygen.

6. The apparatus as described in Claim 1, wherein said radio frequency voltage has a frequency of 13.56 Megahertz.

7. The apparatus as described in Claim 1, wherein said apparatus is enclosed by a ground enclosure and a first radio frequency voltage having a first phase is applied between said electrode and said ground enclosure and a second radio frequency voltage having a second phase offset from said first phase is applied between said electrically conductive enclosure and said ground enclosure.

8. The apparatus as described in Claim 7, wherein said second phase is offset from said first phase by up to 180°.

9. Apparatus for processing materials in an atmospheric pressure radio-frequency non-thermal plasma comprising:

an electrically conductive enclosure defining an interior space with a surface and inlets for a gas and for entry and exit of a material to be processed;

an electrode spaced apart from said electrically conductive enclosure and capable of placing said material to be processed inside said interior space between said electrically conductive enclosure and said electrode, said material to be processed being in contact with said electrode;

wherein a gas introduced into said inlet for gas and a radio-frequency voltage applied between said electrically conductive enclosure and said electrode creates a plasma in said interior space for processing said material to be

processed as it passes through said electrically conductive enclosure.

10. The apparatus as described in Claim 9, wherein said electrode and said electrically conductive enclosure are cylindrically shaped.

11. The apparatus as described in Claim 9, wherein said electrode is a rotating roller.

12. The apparatus as described in Claim 9, wherein said gas is comprised of an inert gas and a chemically reactive gas.

13. The apparatus as described in Claim 12, wherein said inert gas is helium and said chemically reactive gas contains oxygen.

14. The apparatus as described in Claim 13, wherein said gas is introduced at a low flow rate.

15. The apparatus as described in Claim 9, wherein said radio frequency voltage has a frequency of 13.56 Megahertz.

16. The apparatus as described in Claim 9, wherein said apparatus is enclosed by a ground enclosure and a first radio frequency voltage having a first phase is applied between said radio frequency electrode and said ground enclosure and a second radio frequency voltage having a second phase offset from said first phase is applied between said electrically conductive enclosure and said ground enclosure.

17. The apparatus as described in Claim 16, wherein said second phase is offset from said first phase by up to 180°.

18. Apparatus for processing materials in an atmospheric pressure radio-frequency non-thermal plasma comprising:

an electrically conductive enclosure defining a first interior space, gas inlet and outlets and an opening for radio-frequency voltage connection;

a conformal electrode located in said interior space, said electrode defining an opening for said gas inlet and a second interior space;

a physical connector for retaining an electrically conductive object to be processed in close proximity to said electrode;

wherein gas introduced through said gas inlet and a radio-frequency voltage applied between said physical connector and ground creates a plasma between said electrode and said electrically conductive object to be processed thereby providing processing of said electrically conductive object.

19. The apparatus as described in Claim 18, further comprising at least one heater means in said second interior space for maintaining a predetermined temperature in said second interior space.

20. The apparatus as described in Claim 18, wherein said gas is comprised of an inert gas and a chemically reactive gas.

21. The apparatus as described in Claim 20, wherein said inert gas is helium and said chemically reactive gas contains oxygen.

22. The apparatus as described in Claim 18 wherein said gas is introduced at a low flow rate.

23. The apparatus as described in Claim 18 wherein said radio-frequency voltage has a frequency of 13.56 MHz.

24. The apparatus as described in Claim 18, wherein a first radio frequency voltage having a first phase is applied between said electrode and said electrically conductive enclosure and a second radio frequency voltage having a second phase offset from said first phase is applied between said physical connector and said electrically conductive enclosure.

25. The apparatus as described in Claim 24, wherein said second phase is offset from said first phase by up to 180°.